

STAGED SEBUM-PROTECTING SKIN CARE COMPOSITION FOR INFANT AND CHILD SKIN BARRIER PROTECTION

TECHNICAL FIELD

5 The present disclosure relates to the field of skin care products for infants and children, and specifically relates to a staged sebum-protecting skin care composition for infant and child skin barrier protection.

BACKGROUND

10 Skin is the first line of defense of a human body and has a very important barrier function. Like other organs of the human body, the skin is not perfectly developed in childhood. Especially, the skin structure of an infant and child is quite different from that of an adult, and the skin sensitivity of the infant and child is much higher than that of the adult, so that the skin of the infant and child is easily affected by changes in the external environment. At the turn of winter and spring, the weather is
15 barely warm but still cold, alternately hot and cold, and changeable. At the moment, the skin of the infant and child is prone to a series of sensitive problems such as redness, roughness, chapping, peeling and itching, and parents often get frustrated because they cannot find effective skin care products. The skin problems of the infants and children seem to be the same, but with the development of monolayer cells and collagen fibers of the skin of the infants and children, physique and skin
20 conditions of each infant and each child are different in different growth stages, so that skin requirements of the infants and children are also quite different. Medical research has proved that the skin of a newborn is only two-thirds as thick as that of the adult, so that medical care for thin and sensitive skin is needed. Just as the milk powder of infants and children needs to be staged, the skin care of the infants and children also needs to be staged with the development of monolayer cells and
25 collagen fibers of the skin of the infants and children. The skin of the newborn is thin and tender, and the stratum corneum is not yet mature, so that the newborn needs enough sleep time. The infants and children are in development stages, full of curiosity about everything, and energetic and active, but have delicate and sensitive skin. Moreover, when the infants and children carry out outdoor activities under care of the adult, the external influence on the infants and children gradually increases, so that
30 more professional care is needed.

At present, the skin care products for infants and children in the market mainly have effects of

isolation, moisturizing and moistening, but there is a lack of products capable of really improving a skin barrier. The skin of the infants and children itself cannot produce oil, and skin compositions of the infants and children in different ages are different. Therefore, according to skin development and maturity characteristics of the infants and children in different ages, it is of practical significance and broad market prospect to develop and design a skin care product for infants and children with a staged sebum-protecting skin care formula.

SUMMARY

The present disclosure relates to a precisely designed formula with staged sebum-protecting skin care ingredients according to skin development and maturity characteristics of infants and children in different ages: for newborns (0 day to 28 days), the formula is designed based on a fetal ester model; and for infants and children (1 month to 36 months), the formula is designed based on skin barrier protection. Different proportions of core ingredients reflect the scientificity of staged sebum-protection.

In order to solve the above technical problems, the technical solutions used in the present disclosure are as follows.

A staged sebum-protecting skin care composition for infant and child skin barrier protection, which is suitable for newborns aged 0 day to 28 days, wherein the skin care composition comprises the following ingredients in parts by weight: 0.05 to 6 parts ceramide, 0.1 to 5 parts phytosphingosine, 0.5 to 4 parts cholesterol, 0.2 to 5 parts D-panthenol, 0.1 to 4 parts sodium hyaluronate, 0.1 to 6 parts sunflower seed oil, 0.1 to 6 parts evening primrose seed oil, 0.1 to 4 parts vitamin E, 0.1 to 12 parts glycerin, 0.1 to 20 parts shea butter oil, 0.1 to 10 parts emulsifier, and 40 to 60 parts deionized water.

Preferably, the skin care composition comprises the following ingredients in parts by weight: 0.1 to 5 parts ceramide, 0.5 to 5 parts phytosphingosine, 1 to 3 parts cholesterol, 0.5 to 4 parts D-panthenol, 0.1 to 3 parts sodium hyaluronate, 0.3 to 5 parts sunflower seed oil, 0.2 to 5 parts evening primrose seed oil, 0.2 to 3 parts vitamin E, 0.5 to 10 parts glycerin, 1 to 16 parts shea butter oil, 0.5 to 6 parts emulsifier, and 45 to 55 parts of deionized water.

Preferably, the skin care composition comprises the following ingredients in parts by weight: 4 parts ceramide, 2 parts phytosphingosine, 2 parts cholesterol, 2 parts D-panthenol, 2 parts sodium hyaluronate, 5 parts sunflower seed oil, 4 parts evening primrose seed oil, 3 parts vitamin E, 3 parts glycerin, 6 parts shea butter oil, 2 parts emulsifier, and 50 parts deionized water.

A staged sebum-protecting skin care composition for infant and child skin barrier protection,

which is suitable for infants and toddlers aged 1 month to 36 months, wherein the skin care composition comprises the following ingredients in parts by weight: 2 to 4 parts ceramide, 2 to 6 parts phytosphingosine, 4 to 6 parts cholesterol, 2 to 4 parts D-panthenol, 2 to 4 parts sodium hyaluronate, 0.1 to 6 parts sunflower seed oil, 0.1 to 6 parts evening primrose seed oil, 2 to 4 parts vitamin E, 6 to 12 parts glycerin, 1 to 12 parts shea butter oil, 0.5 to 4 parts emulsifier, and 30 to 40 parts deionized water.

Preferably, the skin care composition comprises the following ingredients in parts by weight: 2.5 to 3.5 parts ceramide, 3 to 5 parts phytosphingosine, 4.5 to 5.5 parts cholesterol, 2.5 to 3.5 parts D-panthenol, 3 to 4 parts sodium hyaluronate, 0.5 to 6 parts sunflower seed oil, 0.2 to 5 parts evening primrose seed oil, 3 to 4 parts vitamin E, 7 to 9 parts glycerin, 2 to 11 parts shea butter oil, 1 to 3 parts emulsifier, and 32 to 36 parts deionized water.

Preferably, the skin care composition comprises the following ingredients in parts by weight: 3 parts ceramide, 4 parts phytosphingosine, 5 parts cholesterol, 3 parts D-panthenol, 3 parts sodium hyaluronate, 4 parts sunflower seed oil, 4 parts evening primrose seed oil, 3 parts vitamin E, 8 parts glycerin, 5 parts shea butteroil, 2 parts emulsifier, and 35 parts deionized water.

Further, the present disclosure also provides use of the staged sebum-protecting skin care composition for infant and child skin barrier protection in preparation of a skin care product for infants and children.

Further, the present disclosure also provides a skin care product for infants and children, which is prepared from the skin care composition and corresponding excipients.

Preferably, the skin care product for infants and children is any one selected from the group consisting of skin tonic, skin lotion, skin cream, buttock ointment, massage oil, isolation care lotion, prickly heat powder, body lotion, body powder, lip balm, wet wipes, shampoo, body wash, shampoo body wash, and hand soap.

Preferably, a mass percentage of the skin care composition in the skin care product for infants and children is 2% to 50%.

Vernix caseosa is a natural skin protective agent rich in lipid, and is mainly composed of 81% water, 10% protein and 9% lipid. The natural vernix caseosa protein is composed of epidermis-derived protein (which is mainly a keratin and a filaggrin), micro amount (micromolar to millimolar concentration) of regulatory protein (such as an epidermal growth factor), and micro amount (micromolar to millimolar concentration) surfactant protein (such as a surfactant-related protein A and a surfactant-related protein B). The vernix caseosa can protect and repair the skin at the same

time, which is conducive to maintaining the skin water balance and skin temperature of the newborn, helps the skin to maintain a normal skin moisture activity, is beneficial for damaged skin and dry skin, and is of great help to form a skin barrier.

Main ingredients of the stratum corneum lipid (which is namely a barrier lipid) are: ceramide,
5 free fatty acid, cholesterol, phytosphingosine, and cholesterol sulfate. It has been proved in literatures that addition of certain proportions of cholesterol, ceramide and free fatty acid in the formula has a good therapeutic effect on skin diseases such as atopic dermatitis. In addition, studies have shown that use of the moisturizing cream containing the same barrier lipid can obviously increase the skin moisture and improve the skin barrier function. Children in different ages have different amounts of
10 barrier lipid in skin, which also provides a good scientific basis for "staged care".

The D-panthenol has a relatively small molecular weight and is easily absorbed by the skin. The D-panthenol may be quickly converted into pantothenic acid when contacting with the skin, and the pantothenic acid is conducive to producing a structural protein needed by the skin, such as collagen, thus making skin cells multiply faster, helping these cells to cross the wound barrier, and helping to
15 form a new skin layer. In addition, the panthenol may quickly form a moisturizing film on the skin when penetrating into the skin, thus helping the skin to maintain moisture and activating some damaged cells.

The sunflower seed oil is rich in unsaturated fatty acid, and comprises 59% linoleic acid, 30% oleic acid, 6% stearic acid, and 5% palmitic acid. Meanwhile, the sunflower seed oil is also rich in
20 natural vitamin E, phytosterol, squalene, and other trace mineral elements. Studies have shown that the fatty acid in the sunflower seed oil is easy to form a protective film on the skin surface due to its good skin-friendliness, which can reduce a water loss of the stratum corneum, thus improving the hydration degree of the stratum corneum and helping the skin to maintain a good natural barrier function. In addition, the sunflower seed oil is rich in linoleic acid, so that the sunflower seed oil may
25 inhibit inflammatory factors, thus having a certain anti-inflammatory effect.

The evening primrose seed oil is a natural plant oil, and comprises a saturated fatty acid and an unsaturated fatty acid. The evening primrose seed oil has high contents of oleic acid, linoleic acid, γ -linolenic acid and other high-carbon fatty acids, which has a soft and elastic feeling to the skin, a good touch feeling and a good extensibility, is easily absorbed by skin capillaries, and can promote
30 blood circulation, prevent epidermal cells from keratinization, and maintain the skin moist and smooth. The evening primrose seed oil is excellent in skin protection due to the chemical structure thereof, which is incomparable with other oils. The evening primrose seed oil penetrates into the skin and bonds to ceramide in the skin for esterification to form a mixture of saturated and unsaturated

fatty acids. In addition, in the stratum corneum, the evening primrose seed oil directly acts on the epidermis of the skin to form a best barrier for preventing water loss in the skin, so that the normal barrier function of the skin is restored.

The shea butter oil is a soft solid oil at room temperature, which has a melting point close to the skin temperature, so it is easy to melt when applied. The shea butter oil comprises 80% triglyceride and 9% to 13% unsaponifiable matter, and has good effects on moistening skin, diminishing inflammation, promoting permeability and promoting wound healing. In addition, the shea butter oil also has a slight ultraviolet blocking effect.

Compared with the prior art, the present disclosure has the below beneficial effects: the "brick-mortar" model is most commonly used for describing the structure of the skin barrier, which means that the keratinocyte and the internal structural protein thereof form the "brick" of the skin barrier, while the skin lipid forms the "mortar" to jointly maintain the integrity of the skin barrier. The stratum corneum lipid comprises ceramide, free fatty acid, cholesterol, phytosphingosine, cholesterol sulfate, and other ingredients, which fully fill the cell gap of the stratum corneum. Therefore, addition of certain proportions of ceramide, cholesterol and free fatty acid in the formula as effective supplementation to the skin lipid can improve the skin barriers functions of the infants and children. The D-panthenol is easy to penetrate into the stratum corneum, and has a strong moisturizing effect, which is conducive to relieving skin discomfort and itching. The comparative experiment shows that, the four ingredients of ceramide, phytosphingosine, cholesterol and D-panthenol are mixed in a certain proportion, and the addition proportions of the above-mentioned ingredients in the skin care composition for infants and children are adjusted according to the skin development and maturity characteristics of the infants and children in different ages, so that a precisely designed formula with staged sebum-protecting skin care ingredients can be obtained, thus achieving the synergistic effect of protecting the skin barriers of the infants and children. Through reasonable compatibility of the ingredients, the staged sebum-protecting skin care composition of the present disclosure has a good skin barrier repair effect on the infants and children in different ages, is safe and reliable to use, has remarkable effects, and a broad market application prospect.

DETAILED DESCRIPTION

The technical solutions in the embodiments of the present disclosure are clearly and completely described hereinafter. Obviously, the described embodiments are only some but not all of the embodiments of the present disclosure. Based on the embodiments in the present disclosure, all other embodiments obtained by those of ordinary skills in the art without any creative work should fall

within the protection scope of the present disclosure. Unless otherwise specified, the materials and reagents used are all commercially available reagents and materials.

Embodiment 1 Formula of the skin care composition

Table 1 Ingredients of staged sebum-protecting skin care composition for infant and child skin barrier protection (part by weight)

	Suitable for newborns aged 0 day to 28 days			Suitable for infants and toddlers aged 1 month to 36 months		
	Formula A	Comparative Formula 1	Comparative Formula 2	Formula B	Comparative Formula 3	Comparative Formula 4
Ceramide	4	5	-	3	4	-
Phytosphingosine	2	2.5	-	4	5	-
Cholesterol	2	2.5	-	5	6	-
D-panthenol	2	-	10	3	-	15
Sodium hyaluronate	2	2	2	3	3	3
Sunflower seed oil	5	5	5	4	4	4
Evening primrose seed oil	4	4	4	4	4	4
Vitamin E	3	3	3	3	3	3
Glycerin	3	3	3	8	8	8
Shea butter oil oil	6	6	6	5	5	5
Emulsifier	2	2	2	2	2	2
Deionized water	50	50	50	35	35	35

Embodiment 2 Microbiological test

Skin care composition samples of Formula A and Formula B were detected according to the standard of *Safety and Technical Standards for Cosmetics (2015)* respectively, and results showed that the number of colonies was less than 10 CFU/g, the total number of molds and yeasts was less than 10 CFU/g, and pseudomonas aeruginosa, heat-resistant coliform and staphylococcus aureus were not detected, all of which met the requirements of the standard.

Embodiment 3 Skin irritation test

30 children subjects aged 1 to 5 years who had no history of allergic dermatitis were selected for a patch test. About 0.025 ml of skin care composition samples of Formula A and Formula B were applied to small chambers of patch testers, and attached to two sides of back spines of children through special externally used adhesive tapes. The patch testers were removed 24 hours later, and the remaining products if any were gently wiped off through a wet wipe. Results were recorded after 0.5 hour, 24 hours and 48 hours respectively according to the grading standard of skin reaction in *Safety and Technical Standards for Cosmetics (2015)*.

Patch test results: after 0.5 hour, 24 hours and 48 hours, 30 children subjects showed no adverse reaction symptoms such as erythema, burning sensation and itching to the skin care composition samples of Formula A and Formula B, which indicated that the skin care composition of the present disclosure had no skin irritation, and was good in safety performance.

Embodiment 4 Trans-epidermal water loss test and skin elasticity test

30 children aged 1 year to 3 years suffering from pediatric eczema with skin damage were selected. The children were randomly divided into 6 groups, with 5 children in each group, and administrated with the skin care composition of Formula A, the skin care composition of Formula B, and the skin care compositions of Comparative Formula 1 to Comparative Formula 4 respectively. The skin barriers functions were detected by using a CK skin tester, and data of 5 children were averaged. The trans-epidermal water loss (TEWL value, g/hm²) and the skin elasticity (skin elasticity value) were detected at the second week and the fourth week before administration, and at the second week and the fourth week after administration. Test results were shown in Table 2 and Table 3.

Table 2 Trans-epidermal water loss test (TEWL value, g/hm²)

	Initial stage	Second week	Fourth week	Trans-epidermal water loss reduction degree on the fourth week compared with the initial stage
Formula A	16.25	14.35	12.28	24.4 %
Comparative Formula 1	16.36	15.27	14.12	13.7 %
Comparative Formula 2	16.57	15.87	14.76	10.9 %
Formula B	16.38	14.12	11.87	27.5%
Comparative	16.42	15.01	14.11	14.1 %

Formula 3				
Comparative Formula 4	16.23	15.13	14.58	10.2 %

It can be seen from the test results in Table 2 that, the skin care compositions of Formula A and Formula B in the present disclosure can reduce the trans-epidermal water loss by more than 24.4% after four weeks, while the skin care compositions of Comparative Formulas 1 to the 4 lacking D-panthenol or the mixture of ceramide, phytosphingosine and cholesterol can only reduce the trans-epidermal water loss by less than 15% after four weeks, there is a significant difference. It is indicated that when ceramide, phytosphingosine, cholesterol and D-panthenol mixed in a certain proportion are administrated to the damaged skin of infants and children, the four ingredients may produce a synergistic effect of repairing skin barrier, so that the damaged skin is obviously improved.

Table 3 Skin elasticity test (skin elasticity value)

	Initial stage	Second week	Fourth week	Skin elasticity improvement rate
Formula A	15.3	18.6	21.7	41.8 %
Comparative Formula 1	15.1	16.4	18.1	19.9%
Comparative Formula 2	15.8	16.9	18.3	15.8%
Formula B	14.9	15.9	20.9	40.3 %
Comparative Formula 3	15.2	17.1	18.5	21.7 %
Comparative Formula 4	15.6	17.5	18.3	17.3%

It can be seen from the test results in Table 3 that, after administrating the skin care compositions of Formula A and Formula B in the present disclosure, the skin elasticity improvement rate can be more than 40% after four weeks, while after administrating the skin care compositions of Comparative Formulas 1 to the 4 lacking D-panthenol or the mixture of ceramide, phytosphingosine and cholesterol, the skin elasticity improvement rate can only be about 20% after four weeks, there is a significant difference. It is indicated that when ceramide, phytosphingosine, cholesterol and D-panthenol mixed in a certain proportion are administrated to the damaged skin of infants and children, the four ingredients may produce a synergistic effect of repairing skin barrier, so that the damaged skin is obviously improved.

The above description is only the preferred embodiments of the present disclosure, and it should be pointed out that those of ordinary skills in the art may further make several improvements or equivalent substitutions without departing from the principle of the present disclosure, and these improvements or equivalent substitutions should also be regarded as falling within the scope of
5 protection of the present disclosure.

CLAIMS

1. A staged sebum-protecting skin care composition for infant and child skin barrier protection, which is suitable for newborns aged 0 day to 28 days, wherein the skin care composition comprises the following ingredients in parts by weight: 0.05 to 6 parts ceramide, 0.1 to 5 parts phytosphingosine, 0.5 to 4 parts cholesterol, 0.2 to 5 parts D-panthenol, 0.1 to 4 parts sodium hyaluronate, 0.1 to 6 parts sunflower seed oil, 0.1 to 6 parts evening primrose seed oil, 0.1 to 4 parts vitamin E, 0.1 to 12 parts glycerin, 0.1 to 20 parts shea butter oil, 0.1 to 10 parts emulsifier, and 40 to 60 parts deionized water.
2. The skin care composition according to claim 1, comprising the following ingredients in parts by weight: 0.1 to 5 parts ceramide, 0.5 to 5 parts phytosphingosine, 1 to 3 parts cholesterol, 0.5 to 4 parts D-panthenol, 0.1 to 3 parts sodium hyaluronate, 0.3 to 5 parts sunflower seed oil, 0.2 to 5 parts evening primrose seed oil, 0.2 to 3 parts vitamin E, 0.5 to 10 parts glycerin, 1 to 16 parts shea butter oil, 0.5 to 6 parts emulsifier, and 45 to 55 parts deionized water.
3. The skin care composition according to claim 2, comprising the following ingredients in parts by weight: 4 parts ceramide, 2 parts phytosphingosine, 2 parts cholesterol, 2 parts D-panthenol, 2 parts sodium hyaluronate, 5 parts sunflower seed oil, 4 parts evening primrose seed oil, 3 parts vitamin E, 3 parts glycerin, 6 parts shea butter oil, 2 parts emulsifier, and 50 parts deionized water.
4. A staged sebum-protecting skin care composition for infant and child skin barrier protection, which is suitable for infants and toddlers aged 1 month to 36 months, wherein the skin care composition comprises the following ingredients in parts by weight: 2 to 4 parts ceramide, 2 to 6 parts phytosphingosine, 4 to 6 parts cholesterol, 2 to 4 parts D-panthenol, 2 to 4 parts sodium hyaluronate, 0.1 to 6 parts sunflower seed oil, 0.1 to 6 parts evening primrose seed oil, 2 to 4 parts vitamin E, 6 to 12 parts glycerin, 1 to 12 parts shea butter oil, 0.5 to 4 parts emulsifier, and 30 to 40 parts deionized water.
5. The skin care composition according to claim 4, comprising the following ingredients in parts by weight: 2.5 to 3.5 parts ceramide, 3 to 5 parts phytosphingosine, 4.5 to 5.5 parts cholesterol, 2.5 to 3.5 parts D-panthenol, 3 to 4 parts sodium hyaluronate, 0.5 to 6 parts sunflower seed oil, 0.2 to 5 parts evening primrose seed oil, 3 to 4 parts vitamin E, 7 to 9 parts glycerin, 2 to 11 parts shea butteroil, 1 to 3 parts emulsifier, and 32 to 36 parts deionized water.
6. The skin care composition according to claim 5, comprising the following ingredients in parts by weight: 3 parts ceramide, 4 parts phytosphingosine, 5 parts cholesterol, 3 parts D-panthenol, 3 parts sodium hyaluronate, 4 parts sunflower seed oil, 4 parts evening primrose seed oil, 3 parts vitamin E, 8 parts glycerin, 5 parts shea butter oil, 2 parts emulsifier, and 35 parts deionized water.

7. Use of the staged sebum-protecting skin care composition for infant and child skin barrier protection according to any one of claims 1-6 in preparation of a skin care product for infants and children.

5 8. A skin care product for infants and children, wherein it is prepared from the skin care composition according to any one of claims 1- 6 and corresponding excipients.

9. The skin care product for infants and children according to claim 8, wherein the skin care product for infants and children is any one selected from the group consisting of skin tonic, skin lotion, skin cream, buttock ointment, massage oil, isolation care lotion, prickly heat powder, body lotion, body powder, lip balm, wet wipes, shampoo, body wash, shampoo body wash, and hand soap.

10 10. The skin care product for infants and children according to claim 8, wherein a mass percentage of the skin care composition in the skin care product for infants and children is 2% to 50%.